

**IPST Technical Paper Series Number 541**

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A Homolog of a Jasmonate-Induced Protein from Barley

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November 1994

Submitted to  
Plant Physiology

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**Nucleotide Sequence of a cDNA from *Atriplex canescens* (Pursh.) Nutt.:  
A Homolog of a Jasmonate-Induced Protein from Barley**

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The alteration in gene expression which occurs in plants subjected to water shortage has been documented extensively (Skriver and Mundy 1990), and gene cloning and sequencing has shed some light on the molecular processes which may protect cells from the harmful effects of osmotic stress (Bray 1991, 1993). Since plant hormones such as ABA and Jasmonate are in some cases capable of causing expression of water stress-related genes under noninducing conditions, these hormones have been implicated as mediators of environmental cues (Bray 1991, Sembdner and Parthier 1993, Reinbothe et al. 1994). Promoter analysis has succeeded in identifying motifs important for gene induction (Mundy et al. 1990, Michel et al. 1993, Yamaguchi-Shinozaki and Shinozaki 1994), and the activities of some of the cognate DNA binding proteins have been shown to be modulated by hormones (Mundy et al. 1990, Nelson et al. 1994).

Most work to date, however, has been carried out with glycophytes whose growth range, with respect to water potential, is limited. A study of halophytic plants subject to perennial drought and extremes of climate may provide important insight into plant growth under stress. Such plants have been suggested as sources of unique genes or novel genetic mechanisms which might be applied in the genetic engineering of crop plants. As the incidence of drought increases and the areas of land designated as arid or semi-arid expand, a study of halophytic plants becomes increasingly pertinent.

We have isolated a number of cDNA clones of water deficit-inducible genes from the hardy desert shrub *Atriplex canescens* (Saltbush). A cDNA library was constructed from RNA isolated from a plant growing under water deficit (-0.9MPa). The library was differentially screened, and apparent inducible clones were isolated (Adair et al. 1992). The putative polypeptide encoded by one of these clones, pS10-2, shows strong homology to a major Jasmonate-inducible protein in Barley, encoded by cDNA clone pHvJ3015 (Andersen et al. 1992). This homology is confined to the central part of the protein and, in particular, over a stretch of 73 amino acids where there is 33% identity and 57% similarity between the two proteins. The function of the proteins is at present unknown. Experiments showing its induction in response to a variety of environmental and hormonal cues and its pattern of spatial expression should illuminate aspects of the *Atriplex* gene's transduction pathway and the role of the protein within the cell.

Table 1. Characteristics of a cDNA clone which is homologous to a Jasmonate-inducible protein.

Organism:

*Atriplex canescens* (Pursh.) Nutt.

Location in Genome:

Nuclear genome.

Chromosomal Location:

Not determined.

Gene Copy Number:

Not determined.

Gene Product:

A Homolog of a Jasmonate-Inducible Protein from Barley.

Function:

Unknown.

Clone Type:

SacI cDNA fragment cloned into Bluescript vector and designated pS10-2.

**Source:**

cDNA library was constructed in phage vector  $\lambda$ ZAP (Stratagene, CA) using polyadenylated RNA isolated from 3-year-old plant growing at a water potential of -0.9 MPa.

**Isolation:**

Library was differently screened using first-strand, radiolabelled cDNA derived from plants at water potential -0.4MPa (control) and from plants at -0.9MPa (water deficit). Clones exhibiting differential hybridization to the two probes were isolated, rescreened, and rescued as "phagemids." cDNA inserts were then used as probes in Northern analysis to confirm that water deficit caused steady state levels of the corresponding RNA to increase.

**Method of Identification:**

Homology to a sequenced cDNA.

**Sequencing Methods:**

Homologous oligonucleotides were designed and used to prime dideoxy sequencing using Sequenase (United States Biochemicals). Both strands of the clone were completely sequenced in overlapping reactions.

**Features of cDNA sequence:**

The clone has a cDNA insert of 880 nucleotides. The sequence begins in a long open reading frame; however, two ATGs situated 30 nucleotides and 47 nucleotides downstream have reasonable context agreement with the Kozak sequence and may specify an initiating Methionine. Starting from first ATG the cDNA could encode a polypeptide of 185 amino acids. This open reading frame is followed by a 3' untranslated region of 284 nucleotides and a polyA tail. The central region of the pS10-2 protein, from residue 41 (counting from the first AUG) to residue 113, has strong homology (33% identity, 57% similarity) to the central region of Barley Jasmonate-inducible protein product of cDNA clone pHvJ3015.

**GC Content:**

39.32%

**Expression Profile:**

The steady state RNA level rises in plants subjected to water deficit.

**Antibodies:**

Specific Antibodies are not available.

**Subcellular Localization of Protein Product:**

To be determined.

**Suborganellar Localization of Protein Product:**

To be determined.

**ACKNOWLEDGMENT**

The authors thank Dr. Larry Harris-Haller of DNA Technologies Laboratories at Texas A&M University.

This work was supported by the Temple Inland Foundation, Diboll, Texas; the Texas Agricultural Experiment Station; and USDA Special Grants Program, Award No. 90-34171-5305.

The GenBank accession number for the sequence reported in this article is U15657.

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